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Indian Standard
SPECIFICATION FOR PLASTICS GRADUATED MEASURING CYLINDERS

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Indian Standard

SPECIFICATION FOR PLASTICS GRADUATED MEASURING CYLINDERS

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Indian Standard
SPECIFICATION FOR PLASTICS GRADUATED MEASURING CYLINDERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 8 February 1982, after the draft finalized by the Laboratoryware and Related Apparatus Sectional Committee had been approved by the Chemical Division Council.

0.2 The use of plastics graduated measuring cylinders is on the increase in laboratories in this country and outside. Accordingly, need was felt for formulating this standard with a view to providing guidance to both the manufacturers and users of this item in respect of nominal capacities, quality requirements, dimensions, accuracy, etc. However, attempt has also been made to align the provisions, as far as possible, with those of IS : 878-1975* and at the same time assistance has been derived from Doc: N 240 'Plastics Laboratoryware — Graduated Measuring Cylinders', issued by ISO/TC 48/SC 1 — Laboratory Glassware and Related Apparatus Volumetric Glassware, of the International Organization for Standardization (ISO).

0.3 In this standard cylinder of capacity 5 ml prescribed in IS : 878-1975* has been dropped and that of capacity 4 000 ml has been added. So far as class of accuracy is concerned this is in alignment with that prescribed in the Indian Standard.

0.4 Before using these graduated cylinders for strong acids, alkalis and oxidizing agents or non-aqueous liquids, users should satisfy themselves that the cylinders are suitable for such applications either by laboratory tests or by reference to the manufacturer or supplier.

0.5 The standard reference temperature of 27°C has been prescribed in preparing this standard (*see* **3.2**). However, the requirement of resistance to extraction of ionic material by water has been given at 20°C which may subsequently be reviewed to change from 20°C to 27°C after the relevant data is available (*see* **5.1.1**).

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with

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*Specification for graduated measuring cylinders (*first revision*).

IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for plastics graduated measuring cylinders, provided with a pouring lip, for general laboratory purposes.

2. TERMINOLOGY

2.1 For the purpose of this standard the following definition shall apply.

2.1.1 *Nominal Capacity* — The capacity corresponding to any graduation line shall be defined as the volume of water at 27°C, expressed in millilitres, contained by the cylinder at 27°C when filled to that graduation line in accordance with the method prescribed in **A-1.**

3. BASIS OF ADJUSTMENT

3.1 Unit of Volume — The unit of volume shall be millilitre (ml) in accordance with the International System of Units (SI).

3.2 Reference Temperature — The standard reference temperature, that is, the temperature at which the cylinder is intended to contain its nominal volume (nominal capacity), shall be 27°C.

4. SERIES OF NOMINAL CAPACITIES

4.1 The plastics graduated measuring cylinders shall be of nominal capacities 10, 25, 50, 100, 250, 500, 1 000, 2 000 and 4 000 ml with smallest scale divisions and the maximum ungraduated capacity at the base as prescribed in Table 1.

4.2 Accuracy — There shall be one class of accuracy. When tested in accordance with the method given in Appendix A, the errors on capacity shall not exceed the maximum permissible error as shown in col 5 of Table 1. The error represents the maximum permissible error at any point and also the maximum permissible difference between the errors at any two points.

5. REQUIREMENTS

5.1 Material — Cylinders shall be rigidly constructed of generally non-brittle, transparent or translucent plastics material of suitable chemical and

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*Rules for rounding off numerical values (*revised*).

thermal properties and shall be as free as possible from moulding defects and stresses.

5.1.1 *Resistance to Extraction of Ionic Material by Water at 27°C* — When tested in accordance with the procedure given in Appendix B, the cylinder shall give an aqueous extract, free from suspended matter, and the difference between its conductivity and that of the original water used for the extraction shall not exceed the values given below:

Nominal Capacity ml	*Conductivity Difference,* μS/m
10	600
25	400
50	300
100	250
250	200
500	150
1 000	100
2 000	100
4 000	80

NOTE — The equivalent to the conductivity of water containing approximately one part per million of sodium chloride is 200 μS/m.

5.2 Pattern — Plastics graduated measuring cylinders shall be with a graduated measuring scale. It shall be provided with a spout incorporated in the mould (*see* Fig. 1).

TABLE 1 SMALLEST SCALE DIVISIONS, UNGRADUATED CAPACITIES AND MAXIMUM PERMITTED ERRORS ON CAPACITIES

(*Clauses* 4.1, 4.2 *and* 6.1.2)

SL No.	NOMINAL CAPACITY	SMALLEST SCALE DIVISION	MAXIMUM UNGRADUATED CAPACITY AT BASE	TOLERANCE ON NOMINAL CAPACITY
(1)	(2)	(3)	(4)	(5)
	cm^3 (ml)	cm^3 (ml)	cm^3 (ml)	cm^3 (ml)
i)	10	0·2	1	± 0·2
ii)	25	0·5	2·5	± 0·5
iii)	50	1	5	± 1
iv)	100	1	10	± 1
v)	250	2	20	± 2
vi)	500	5	50	± 5
vii)	1 000	10	100	±10
viii)	2 000	20	200	±20
ix)	4 000	50	400	±50

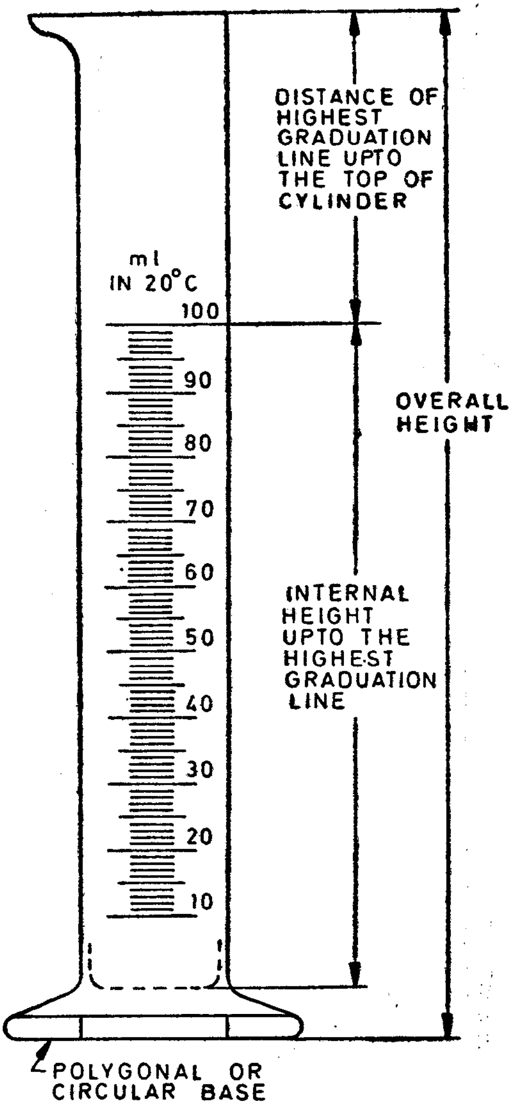
DISTANCE OF HIGHEST GRADUATION LINE UPTO THE TOP OF CYLINDER
ml
IN 20°C
100
90
80
70
60
50
40
30
20
10
OVERALL HEIGHT
INTERNAL HEIGHT UPTO THE HIGHEST GRADUATION LINE
POLYGONAL OR CIRCULAR BASE

FIG. 1 GENERAL APPEARANCE OF PLASTICS GRADUATED MEASURING CYLINDER

5.3 Workmanship and Finish — Measuring cylinders shall be regular in shape, smooth finished and, except for the spout, symmetrical about the axis which shall be perpendicular to the base.

5.3.1 *Stability* — The cylinders shall stand vertically without rocking or spinning when placed on a level surface. They shall not topple when placed empty on a non-slip surface inclined at an angle of 12±1° to the horizontal.

5.3.2 *Base* — The base shall be of a suitable plastics material and may or may not be integral with the body. It may be either polygonal with five or more equal sides or circular.

5.3.3 *Spout* — The spout shall be so formed as to enable the contents of the cylinder to be poured out in a narrow stream without spilling or running down the outside of the cylinder.

5.3.4 *Translucency* — The cylinders shall be constructed in such a manner that when containing transparent liquids, the meniscus can be seen through the cylinder.

5.4 Dimensions — Plastics graduated measuring cylinders shall comply with the dimensional requirements given in Table 2.

TABLE 2 DIMENSIONAL REQUIREMENTS FOR PLASTICS GRADUATED MEASURING CYLINDERS

SL No.	NOMINAL CAPACITY	INTERNAL HEIGHT UP TO THE HIGHEST, GRADUATION LINE, *Min*	OVERALL HEIGHT, *Max*	DISTANCE FROM HIGHEST GRADUATION LINE TO THE TOP OF CYLINDER, *Min*
(1)	(2)	(3)	(4)	(5)
	ml	mm	mm	mm
i)	10	90	150	40
ii)	25	90	170	40
iii)	50	115	200	50
iv)	100	145	260	60
v)	250	200	340	60
vi)	500	250	390	75
vii)	1 000	315	470	75
viii)	2 000	400	570	75
ix)	4 000	460	585	75

5.4.1 *Wall Thickness* — The wall thickness shall be such that when tested for flexibility in accordance with the procedure detailed in Appendix C, the diameter of the cylinder shall not decrease by more than 10 percent and the change in indication arising from any permanent distortion caused by the test procedure shall not exceed the maximum permitted tolerance given in Table 1.

6. GRADUATION AND FIGURING

6.1 Graduation lines — Engraved graduation lines shall be clear, durable, uniform, and of thickness not exceeding 0·3 mm for capacities up to and including 250 ml and not exceeding 0·5 mm for capacities of 500 ml and above.

6.1.1 *Position of Graduation Lines* — The graduation lines shall lie in planes at right angles to the longitudinal axis of the cylinder and shall form a vertical scale on the cylinder on the side facing the viewer when the cylinder is positioned with the lip facing to the left.

6.1.2 Graduation lines may be omitted from the bottom portion of the cylinder, in which case the ungraduated capacity shall not exceed the maximum prescribed in col 4 of Table 1.

6.2 Spacing of Graduation Lines — There shall not be evident irregularity in the spacing of the graduation lines.

6.3 Length of Graduation Lines — Graduation lines shall be in three sizes, namely, long, medium and short (*see* Fig. 2).

6.3.1 The length of the short lines shall be between 10 percent and 12·5 percent of the circumference of the cylinder.

6.3.2 The length of the medium lines be approximately 1·5 times the length of the short lines.

6.3.3 The length of the long lines shall be not less than twice the length of the short lines.

6.3.4 The medium and long lines shall extend symmetrically at each end beyond the ends of the short lines.

6.4 Sequence of Graduation Lines

6.4.1 The sequence of graduation lines on cylinders of capacity 50 ml and 100 ml divided in 1 ml, and capacity 1 000 ml divided in 10 ml, shall be as follows (*see* Fig. 2) :

a) Every tenth graduation line shall be a long line;
b) There shall be a medium line midway between two consecutive long lines; and
c) There shall be four short lines between consecutive medium and long lines.

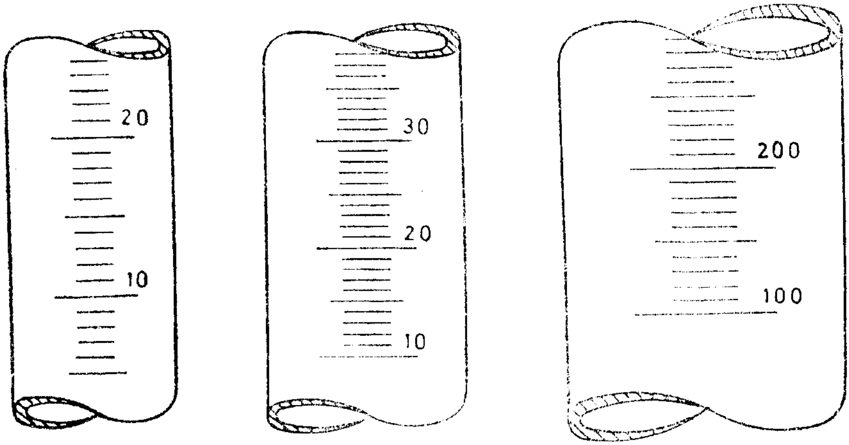

FIG. 2 SCALES OF MEASURING CYLINDERS OF 50, 100 AND 1 000 ml CAPACITY

6.4.2 The sequence of graduation lines on cylinders of capacity 10 ml divided in 0·2 ml, capacity 250 ml divided in 2 ml, and capacity 2 000 ml divided in 20 ml shall be as follows (*see* Fig. 3):

a) Every fifth graduation line shall be a long line; and

b) There shall be four short lines between two consecutive long lines.

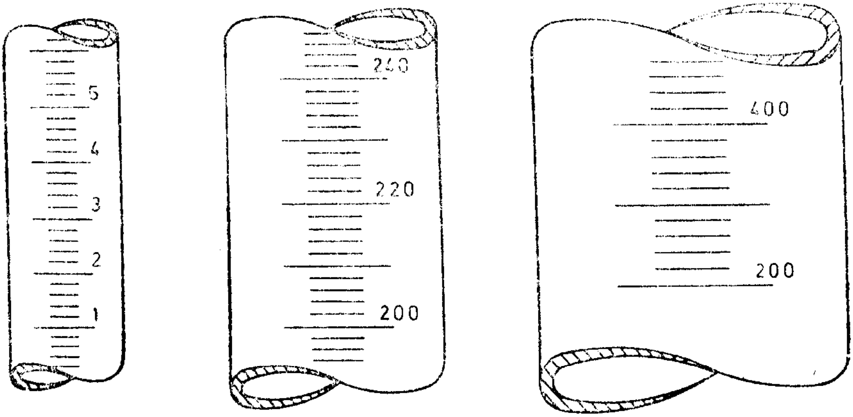

FIG. 3 SCALES OF MEASURING CYLINDERS OF 10, 250 AND 2 000 ml CAPACITY

6.4.3 The sequence of graduation lines on cylinders of capacity 25 ml divided in 0·5 ml, capacity 500 ml divided in 5 ml, and 4 000 ml divided in 50 ml shall be as follows (*see* Fig. 4):

a) Every tenth graduation line shall be a long line;

b) There shall be four medium lines equally spaced between two consecutive long lines; and

c) There shall be one short line between two consecutive medium lines and between consecutive medium and long lines.

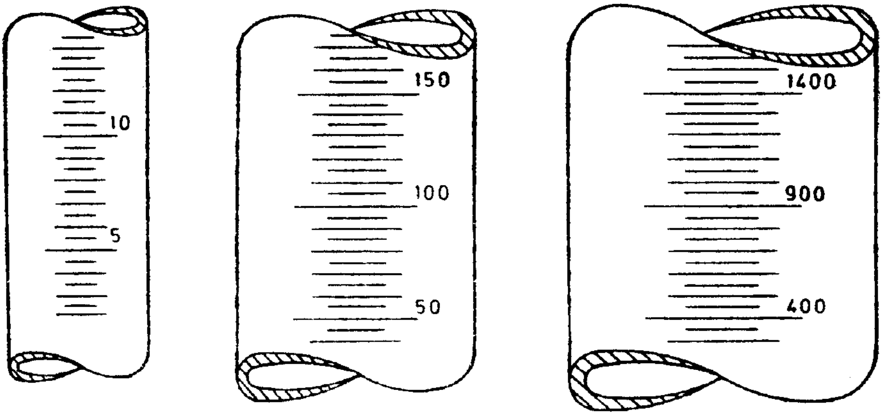

FIG. 4 SCALES OF MEASURING CYLINDERS OF 25, 500 AND 4 000 ml CAPACITY

6.5 Figuring of Graduation Lines — Graduation lines shall be figured as illustrated in Figures 2, 3 and 4, in accordance with the following principles.

NOTE — If a cylinder is provided with a double scale these provisions apply to both scales.

6.5.1 On all cylinders of capacities other than 250 ml and 2 000 ml every long line shall be figured.

6.5.2 On a cylinder of 250 ml capacity, alternate long lines shall be figured from 20 to 240 with an additional figure at 250 ml graduation. On the cylinder of 2 000 ml capacity, alternate long lines shall be figured, but the figuring of all long lines is permitted.

6.5.3 The scheme of figuring shall be such that the figure representing the nominal capacity refers to the highest graduation line.

6.5.4 The figures shall either be placed slightly to the right of the end of the line to which they refer in such a way that an extension of the line would bisect them, or be placed immediately above the long lines to which they refer and slightly to the right of the adjacent shorter lines.

6.5.4.1 If the long lines are extended so as to almost encircle the cylinder the figures shall either be placed immediately above the line. There shall be a break in each long line, slightly to the right of the right-hand ends of the shorter lines, and the figures for that line shall occupy the break, and be placed in such a manner that the line would bisect them.

7. MARKING AND PACKING

7.1 Marking — Plastics graduated measuring cylinders shall be engraved with the following:

a) The symbol ' ml ' to indicate the unit of volume;

b) The inscription ' In 27°C ' to indicate that the cylinder is graduated for content at 27°C; and

c) The name of the manufacturer or his recognized trade-mark, if any.

7.1.1 The following information shall be provided either on each measuring cylinders packed in polyethylene or paper bag or on the label of the primary packing box:

a) The name of the material from which the graduated measuring cylinder is made, for example, ' PP ' (for polypropylene); and

b) The words ' No Flame '.

7.1.2 The manufacturer shall also provide a catalogue giving details of physicochemical properties of the raw material used for manufacture of measuring cylinders and the detergent to be used for washing (*see* **B-1.4**). It may also include the type of solutions that should not be used with the plastics graduated measuring cylinders.

7.1.3 Cylinders may be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7.2 Packing — Each plastics graduated measuring cylinders shall be packed in polyethylene or paper bag and each shall be further packed in card board box. The number of such measuring cylinders packed in a card board box shall be indicated on the label.

8. SAMPLING

8.1 The method of sampling plastics graduated measuring cylinders and the criteria for ascertaining their conformity shall be as prescribed in IS : 4426-1967*.

APPENDIX A

(*Clause* 4.2)

METHOD OF TESTING ACCURACY OF PLASTICS MEASURING CYLINDERS

A-1. PROCEDURE

A-1.1 Thoroughly clean and dry the measuring cylinder. Fill the clean weighed cylinder with distilled water to a few millimetres above the graduation mark to be tested, care being taken to avoid wetting the cylinder above the water surface. Ensure that the cylinder settles down to room temperature before testing, and determine the water temperature, t°C. Adjust the lowest point of the water meniscus to the top edge of the graduation mark in question by withdrawing small amounts of water by means of a glass tube drawn out to a jet at its lower end.

A-1.1.1 If the meniscus is curved, set it by the method detailed below.

A-1.1.1.1 Set the meniscus so that the plane of the upper edge of the graduation line is horizontally tangential to the lowest point of the meniscus, the line of sight being in the same plane.

A-1.2 Determine the mass of the water in the cylinder. Calculate the volume of water at 27°C contained by the cylinder up to the graduation mark tested from the mass thus determined by applying correction for water temperature as described in A-2.

A-2. APPLICATION OF CORRECTION

A-2.1 Obtain the capacity in millilitres of the plastics measuring cylinder at 27°C, by multiplying the mass of pure water in grams contained at t°C by the factor (1 + c).

The quantity ' c ' is given in Table 3 in units of 10^{-5} ml/g for plastics materials having various values for the coefficient of cubical thermal expansion.

NOTE — Manufacturers should be consulted for the appropriate value for this coefficient. The value can be used by linear interpolation in the table.

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*Methods of sampling, laboratory glassware and medical glass instruments.

TABLE 3 VALUES OF THE QUANTITY IN UNITS OF 10^{-5} ml/g USED IN CALIBRATION

(*Clause* A-2.1)

TEMPERATURE	COEFFICIENT OF CUBICAL THERMAL EXPANSION OF THE PLASTICS MATERIAL IN UNITS OF 10^{-5} (°C)$^{-1}$				
°C	20	30	40	50	60
5	410	561	713	865	1 018
6	392	533	675	817	959
7	376	507	638	770	902
8	361	482	603	725	846
9	348	459	570	681	792
10	336	437	537	639	738
11	325	416	507	598	689
12	316	397	477	558	639
13	308	379	449	520	590
14	301	362	422	483	543
15	296	346	396	447	497
16	292	332	372	412	452
17	288	319	349	379	409
18	286	306	327	347	367
19	285	296	306	316	326
20	286	286	286	286	286
21	287	277	267	257	247
22	289	269	249	229	209
23	292	262	232	202	172
24	297	257	217	177	137
25	302	252	202	152	102
26	308	248	188	128	68
27	316	246	176	106	36
28	324	244	164	84	4
29	333	243	153	63	−27
30	343	243	143	43	−56
31	354	244	134	24	−85
32	365	245	126	6	−113
33	378	248	118	−11	−140
34	392	252	112	−27	−166
35	406	256	106	−43	−191

A-2.1.1 The values of 'c' given in the table are applicable at a barometric pressure of 1·013 bar and a temperature of 27°C. When large deviations from these values occur, it may be necessary to take account of second order effects arising from changes in the buoyancy correction caused by variations in atmospheric pressure and temperature and these may be obtained from appropriate tables (*see* IS : 8897-1978*).

A-2.1.2 *Basis of Table* — When weighing a quantity of water at t°C, equilibrium is expressed by :

$$M - \frac{M\sigma}{\Delta} = V_t \rho_t - V_t \sigma$$

where

M = apparent mass of the water in air (g)

σ = density of the air at the time of weighing (g/cm^3), (taken as $1{\cdot}199\,4 \times 10^{-3}$ g/cm^3)

Δ = density of the weights (taken as 8·0 g/cm^3)

V_t = volume of the water at t°C (in cm^3)

ρ_t = density of the water at t°C (in g/cm^3) taken from the table in IS : 8897-1978*.

A-2.1.2.1 if α = coefficient of cubical thermal expansion of the plastics material, then:

$$V_t = V_{27} [1 + \alpha (t - 27)]$$

Eliminating V_t from these two equations leads to

$$1 + C = \frac{1 - \frac{\sigma}{\Delta}}{(\rho_t - \sigma) [1 + \alpha (t - 27)]} = \frac{V_{27}}{M}$$

APPENDIX B

(*Clause* 5.1.1)

TEST FOR IONIC MATERIAL EXTRACTED BY WATER AT 27°C

B-1. APPARATUS AND SOLUTIONS

B-1.1 Watch Glasses — Made of borosilicate glass, sizes appropriate to the cylinders under test.

B-1.2 Conductivity Meter — Suitable for measurement of the electrical conductivity of water.

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*Tables for calibration and method of verification of volumetric glassware.

B-1.3 De-ionized Water — The conductivity of which is less than 200 µS/m.

B-1.4 Detergent Solution — As recommended by the manufacturer.

B-2. PROCEDURE

B-2.1 Thoroughly wash each cylinder under test with hot water and detergent solution, then rinse well with hot, followed by cold water, and finally with liberal quantities of de-ionized water till the conductivity of the final rinse is the same as of the original de-ionized water. Fill each cylinder to its nominal capacity with de-ionized water (*see* **B-1.3**) at 27 ± 2°C. Cover with a clean watch glass and allow to stand for 3 h.

B-2.2 Measure the electrical conductivity of each extract by the method prescribed in **9** of IS : 3025-1964* and deduct from the value obtained the conductivity of the original water used to prepare the extract, also measured at 27°C. Note the difference in conductivity in microsiemens per metre.

APPENDIX C

(*Clause* 5.4.1)

FLEXIBILITY AND RECOVERY TEST FOR PLASTICS CYLINDERS

C-1. APPARATUS

C-1.1 The general arrangement of the apparatus is shown in Fig. 5. The following items are required.

C-1.1.1 *Square Blocks of Wood* — Up to 29 in number, each 19 mm thick, having a square with up to 110 mm sides cut from one corner and not exceeding one quarter of the original block.

C-1.1.2 *Test Pin* — Complying with the requirements of IEC 335 (Part I).

C-1.1.3 *Guide for the Test Finger* — Consisting of a stout plate with a 13 mm hole, adjustable in distance (from 10 mm to 200 mm) from the inside corner of the blocks and adjustable in height (from 60 mm to 300 mm).

C-1.1.4 *Thermometer* — covering the range from 0°C to 100°C graduated at each degree Celsius (*see* Schedule mark 13 of IS : 2480-1973†).

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*Methods of sampling and test (physical and chemical) for water used in industry.

†Specifications for solid-stem general purpose glass thermometers (*first revision*).

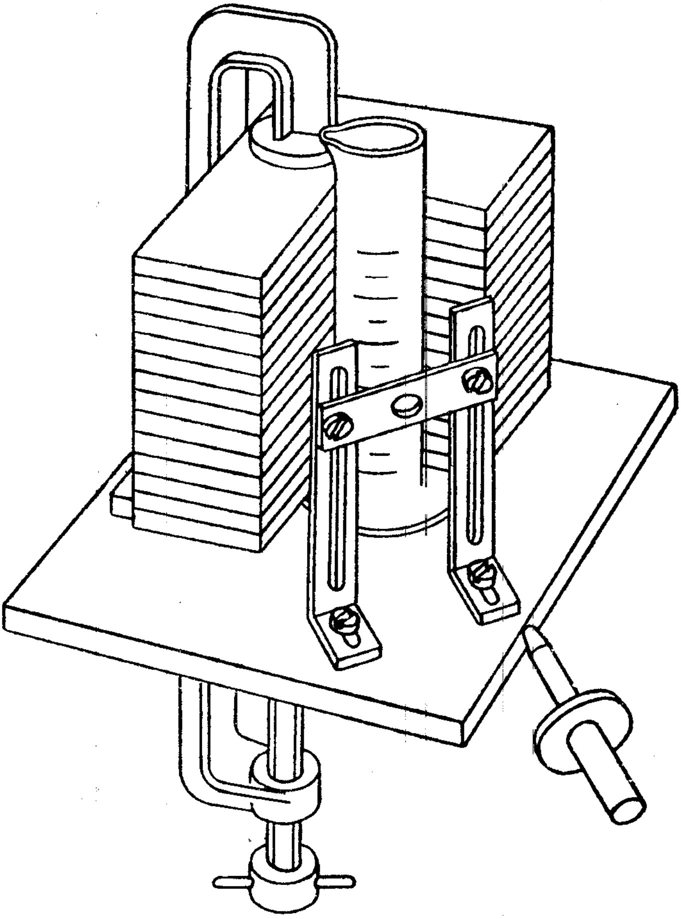

FIG. 5 GENERAL ARRANGEMENT OF EQUIPMENT FOR FLEXIBILITY TEST

C-1.1.5 *Inside Calipers* — opening from 10 mm to 100 mm.

C-1.1.6 *G-Clamp* — One.

C-1.1.7 *Tongs or Holding Device* — for introducing calipers into the measuring cylinder.

C-2. PROCEDURE

C-2.1 Stack sufficient of the L-shaped blocks to bring the highest just below the brim of the measuring cylinder to be tested.

C-2.2 Adjust the blocks so that the lower ones accommodate the base of the measuring cylinder and each of the others touches the measuring cylinder at two points and then clamp the stack to the working surface.

C-2.3 Adjust the brackets bearing the guide so that the test pin, when inserted through the hole, will touch the measuring cylinder at a height equal to half of the total height of the measuring cylinder.

C-2.4 Adjust the brackets or other fixing bearing the guide so that it is fixed 20 mm from the measuring cylinder.

C-2.5 Place the assembly in an enclosure maintained at 27 ± 2°C, and by using the calipers, measure the inside diameter (d mm) of the measuring cylinder at the point of application and in the direction of the force to be applied. Set the calipers at 0·9 d mm.

C-2.6 Insert the test pin and apply a steady force of 30 N as shown by the force indicator of the test pin; horizontally and towards the axis of the measuring cylinder.

C-2.7 If, after the force has been applied for 60 s and while still maintaining the force, the calipers cannot be positioned inside the measuring cylinder at the point of application and in the direction of the applied force, then the diameter has decreased by more than 10 percent and the cylinder has failed the test.

C-2.8 Remove the test pin and rotate the measuring cylinder 90° and repeat from **C-2.5** to **C-2.7**.

C-2.9 Remove the test pin, fill the measuring cylinder to just below its nominal capacity with water at 27 ± 2°C and note the exact reading (V_1 ml), and repeat **C-2.6**.

C-2.10 After the force has been applied for 60 s, remove the test pin, wait for further 60 s, read the volume of the water (V_2 ml), and record the difference ($V_2 — V_1$) arising from any permanent distortion.

C-2.11 Compare the difference ($V_2 — V_1$) with the appropriate value of the maximum permitted error given in col 5 in Table 1.

INDIAN STANDARDS ON LABORATORYWARE AND RELATED APPARATUS

IS:

878-1975	Graduated measuring cylinders (*first revision*)
915-1975	One-mark volumetric flasks (*first revision*)
1117-1975	One-mark pipettes (*first revision*)
1381 (Part I)-1976	Boiling flasks : Part I Flasks with plain neck (*first revision*)
1381 (Part II)-1977	Boiling flasks : Part II Flasks with conical sockets (*first revision*)
1388-1959	Reagent bottles
1541-1978	Glass filter funnels (*first revision*)
1574-1980	Glass weighing bottles (*first revision*)
1575-1960	Separating funnels
1590-1960	Glass filter flasks
1672-1967	Floating dairy thermometers (*first revision*)
1996-1962	Glass stopcocks
1997-1982	Burettes (*second revision*)
2480-1973	Solid-stem general purpose glass thermometers (*first revision*)
2480 (Part II)-1982	General purpose glass thermometers : Part II Enclosed-scale thermometers (*second revision*)
2618-1963	Test-tubes
2619-1971	Glass beakers (*first revision*)
2620-1963	Distilling flasks
2626-1972	Petri dishes (*first revision*)
2627-1979	Glossary of terms relating to liquid-in-glass thermometers (*first revision*)
2836-1974	Methods of test and quality requirements for porcelain laboratory apparatus (*first revision*)
2837 (Part I) -1975	Porcelain crucibles and basins : Part I Crucibles (*first revision*)
2837 (Part II)-1977	Porcelain crucibles and basins : Part II Basins (*first revision*)
3055 (Part I)-1977	Clinical thermometers : Part I Solid-stem type (*first revision*)
3104 (Part I)-1982	Density hydrometers : Part I Requirements (*first revision*)
3104 (Part II)-1982	Density hydrometers : Part II Methods of test and use (*first revision*)
3432-1965	Clay pipe triangles
3608-1966	Glass alcoholometers
3936-1966	Porcelain mortars and pestles
3953-1966	High temperature ceramic cumbustion boats
3990-1967	High temperature ceramic combustion tubes
4161-1967	Nessler cylinders
4162-1967	Graduated pipettes
4426-1967	Methods of sampling laboratory glassware and medical glass instruments
4529-1968	Glass tubes for medical thermometers
4610-1968	Glass tubes for general purpose and reference thermometers
4825-1982	Liquid-in-glass solid-stem reference thermometers (*first revision*)
5009-1962	Buchner funnels
5011-1968	Gooch crucibles
5165-1969	Interchangeable conical ground glass joints
5681-1970	General meterological thermometers, liquid-in-glass
5717-1970	Pyknometers
5725-1970	Pyschrometers unventilated (dry and wet bulb hygrometers)
6017-1971	Thermometers for whirling psychrometers
6052-1970	Glass condensers
6128-1971	Desiccators
6154-1971	Perforated plates for desiccators
6274-1971	Method of calibrating liquid-in-glass thermometers
6500-1972	Thermometer for measurement of sea surface temperature
6592-1972	Soil thermometers
7000-1973	General purpose maximum-minimum thermometers
7324-1974	Brix hydrometers
7374-1974	Glass rods and tubing for laboratory glassware
8728-1977	Adjustable-range thermometers
8729-1977	Principles of construction and adjustment of volumetric glassware
8787-1977	Principles of design, construction and use of liquid-in-glass thermometers
8897-1978	Tables for calibration and methods of verification of volumetric glassware
9213-1979	BOD bottles
9621-1980	Principles of construction and adjustment of glass hydrometers